

Bionomics of *Biston betularia* (L.) in Daxing'an Mountains forest area

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Abstract: Observations on life cycle, habits and characteristics of *Biston betularia* (L.), which is a major pest infecting birch, were made in Daxing'an Mountain forest area, Heilongjiang Province during 1997-1998. In this area, the pest has one generation per year and overwinters as eggs in cracks of the lower part of stem. Adults emerge from mid-July to late August, and the damage of larvae occurs mainly in May and June. Life cycle table of *Biston betularia* was given and control suggestions were made in this paper.

Key words: Bionomics; Life cycle; *Biston betularia* (L.)

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Introduction

Biston betularia (L.) (Lepidoptera: Geometridae) is distributed in Hebei, Qinghai, Inner Mongolia, Liaoning, Jilin and Heilongjiang provinces in China (Zhu 1987). Last 10 years, the pest occurred seriously in Qinghai Province on 276 hm² birch forest stands (Sun *et al.*, 1996). In recent years, there is a trend of outbreak in Daxing'an Mountain forest area of Heilongjiang Province. From 1997 to 1999, we carried out a preliminary study on bionomics of this pest in Jiagedaqi Forestry Research Station, Daxing'anling District, Heilongjiang Province.

Study method

Four fixed sample plots were established, each 20 m × 50 m, in different population density of *Biston betularia* (L.). All the observation were undertaken in these sample plots.

Life cycle

Biston betularia (L.) has one generation per year and overwinters as eggs in cracks of the lower part of the stem in Daxing'an Mountain forest area of Heilongjiang Province. Adults emerge from mid-July to late August. Eggs are laid during mid-August to early September. Overwintered eggs hatch from late April to late May and the harm peak of larvae occurs

mainly in May and June. Pupation occurs from mid-June to late July (Table 1).

Habits and characteristics

Adults

Male adults of *Biston betularia* emerge two or three days earlier than females. In first several days after their emergence, most of the adults active around lower part of birch stem in dusk. Adult males are of phototaxis and adult females are of feign death habit. Mating can last several minutes to several hours and happens mostly at 19:00~21:00 hour. Sex ratio of the male to female is about 1:0.9. Female adults can lay eggs several hours after their mating. An oviposition peak occurs in 2-4 days after mating. The life-span of adult is in range of 4-11 days, with an average of 6 days. Life-span of male is about two days shorter than that of female.

Eggs

Biston betularia lays 23 eggs per time in average and most of them are laid on lower part of birch stem. Egg is round, about 0.4 mm in diameter, green at first, and then changes to red brown gradually.

Larvae

Newly hatched larvae of *Biston betularia* crawl up to leaves and begin to eat, and in most cases one larva occupies one leaf. The larvae may drop to the ground with silken threads when they are disturbed by people or animals.

Larvae have five instars in total. The peak period of damage occurs during mid-May to early June when the larvae are up to third to fifth instars. Grown larvae crawl down or drop into the ground with silken

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threads for pupation. There are three main ways for spread and migration of larvae, crawling, wafting by wind and carrying by people and animals. The favorite host plant of larvae is white birch (*Betula platyphilla*), but they also eat leaves of poplar, elm, willow, shrub and even grass on the ground during their outbreak period. Newly hatched larva is 2-3 mm long and fully-grown larva is about 21-23 mm long.

Pupae

Biston betularia begins to pupate from mid-June to late July in 1-3 cm deep soil. During the period of outbreak years, because of the shortage of food and high density of population, the pupation rate is lower than usual. Pupa is 7-10 mm long, and the color may change from green at first to red brown or blackish brown at last.

Table 1. Life cycle table of *Biston betularia* (L.)

Jan.-March			April			May			June			July			August			Sept.			Oct.-Dec.		
F	S	L	F	S	L	F	S	L	F	S	L	F	S	L	F	S	L	F	S	L	F	S	L
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• egg; —larva; ○pupa; + adult; F: first 10 days; S: second 10 days; L: last 10 days

Control suggestions

- (1) Construction of larch and birch mixed forest stand can reduce damage the pest efficiently.
- (2) Collect the eggs and burn up.
- (3) Lure the male adults with black lamp and kill them.
- (4) There are several natural enemies of the pest, such as one species of Bracornidae, two species of spiders, several species of birds and virus etc. Proper protection and use of these natural ene-

mies can control the pest efficiently.

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